CLAIMS

What is claimed is:

~~1. A method for fabricating a device that emits light in blue or green wavelengths:~~

~~i) providing a substrate comprising a surface layer of a group III-nitride~~ nitrides ~~such as GaN~~ , ~~maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the substrate;~~

~~ii) maintaining the substrate at about the temperature of step i), and flowing indium precursor at a flow rate of less than 100 µmol/min between 2 and 5 seconds, and N-precursor over the layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;~~

~~iii) maintaining the substrate at about the temperature of step i), and forming a well layer of $In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;~~

~~iv) maintaining the substrate at about the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;~~

~~v) forming a second cap layer of GaN or AlGaN over the first cap layer;~~

~~thereby obtaining a device that emits light in blue or green wavelengths.~~

~~2. The method of claim 1, wherein the group III-nitride is GaN.~~

~~3~~ 12. A method for fabricating a device that emits light in blue or green wavelengths comprising:

i) providing a substrate comprising a surface layer of a group III-~~nitride~~ nitrides ~~such as GaN~~, maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a layer of $Al_uGa_{1-u}N$, wherein u ranges from 0 to 0.30, over the substrate;

ii) maintaining the substrate at about the temperature of step i), and forming a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the $Al_uGa_{1-u}N$;

iii) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

iv) maintaining the substrate at about the temperature of step i), and forming a well layer of $In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

v) maintaining the substrate around/at the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

vi) forming a second cap layer of GaN or AlGaN over the first cap layer;

thereby obtaining a device that emits light in blue or green wavelengths.

4 2. The method of claim ~~3~~ 1, wherein the group III-nitride is GaN.

~~5 3. A method for fabricating a device that emits light in blue or green wavelengths comprising:~~

~~i) providing a substrate comprising a surface layer of a group III-nitride~~ nitrides ~~such as GaN, maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the substrate;~~

~~ii) maintaining the substrate at about the temperature of step i), and forming quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$, on the surface by flowing over the surface a composition comprising biscyclopentadienyl magnesium, dimethyl zinc, silane or tetraethyl silane;~~

~~iii) maintaining the substrate at about the temperature of step i), and forming a well layer of $In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;~~

~~iv) maintaining the substrate at about the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;~~

~~v) forming a second cap layer of GaN or AlGaN over the first cap layer;~~

~~thereby obtaining a device that emits light in blue or green wavelengths.~~

~~6. The method of claim 5, wherein the group III-nitride is GaN.~~

~~7~~ 4. ~~The method of claim 1 or 2, wherein the forming steps are performed by metalorganic chemical vapor deposition using trimethyl indium, triethyl indium, ethyldimethyl indium or a mixture of at least two thereof as an indium precursor.~~

~~8~~ 5. ~~The method of any one of claims 1, 2 or 7~~ claim 1 or 4, ~~wherein trimethyl gallium, triethyl gallium, ethyldimethyl gallium or a mixture of at least two thereof is used as a gallium precursor.~~

~~9~~ 6. ~~The method of claim 8~~ 5, ~~wherein ammonia or dimethylhydrazine is used as a nitrogen~~ Nitrogen ~~precursor and hydrogen, nitrogen or a mixture thereof is used as a carrier gas.~~

~~10~~ 37. ———The method of claim ~~3~~ 12, wherein the forming steps are performed by metalorganic chemical vapor deposition using trimethyl indium, triethyl indium, ethyldimethyl indium or a mixture of at least two thereof as an indium precursor.

~~11~~ 48. ———The method of any one of claims ~~3, 4~~ 1, ~~2claim 2~~ or ~~10~~ 37, wherein trimethyl gallium, triethyl gallium, ethyldimethyl gallium or a mixture of at least two thereof is used as a gallium precursor.

~~12~~ 59. ———The method of claim ~~11~~ 48, wherein ammonia or dimethylhydrazine is used as a ~~nitrogen~~ **nitrogenN** precursor and hydrogen, nitrogen or a mixture thereof is used as a carrier gas.

~~13~~ **6. A method for fabricating a device that emits light in blue or green wavelengths comprising:**

i) providing a substrate comprising a surface layer of a group III-nitride, maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a first layer of GaN or $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the substrate;

ii) maintaining the substrate at about the same temperature as the temperature of step i), and forming a second layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the first layer;

iii) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the second layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

iv) maintaining the substrate at about the temperature of step i), and forming a well layer of
$In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

v) maintaining the substrate at about the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

vi) forming a second cap layer of GaN or AlGaN over the first cap layer; thereby obtaining a device that emits light in blue or green wavelengths.

7. The method of claim 6, wherein the group III-nitride is GaN.

8. A method for fabricating a device that emits light in blue or green wavelengths comprising:

i) providing a substrate comprising a surface layer of a group III-nitride, maintaining the substrate at a temperature ranging from 700°C to 850°C, and forming a first layer of GaN or $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the substrate;

ii) maintaining the substrate at about the same temperature as in step i), and forming a second layer of $Al_uGa_{1-u}N$, wherein u ranges from 0 to 0.30, over the first layer;

iii) maintaining the substrate at about the temperature of step i), and forming a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, over the $Al_uGa_{1-u}N$;

iv) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

v) maintaining the substrate at about the temperature of step i), and forming a well layer of

$In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

vi) maintaining the substrate around/at the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

vii) forming a second cap layer of GaN or AlGaN over the first cap layer; thereby obtaining a device that emits light in blue or green wavelengths.

9. A method for fabricating a device that emits light in blue or green wavelengths comprising:

i) forming upon a substrate having a surface layer, at a temperature of from 700°C to 850°C, a layer of $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, or a layer of $Al_uGa_{1-u}N$, wherein u ranges from 0 to 0.30, over the first layer;

ii) maintaining the substrate at about the temperature of step i), and flowing indium-precursor at a flow rate of less than 100 μmol/min between 2 and 5 seconds, and N-precursor over the second layer of $In_xGa_{1-x}N$ to form quantum dots of $In_wGa_{1-w}N$, wherein $w > 0.20$;

iii) maintaining the substrate at about the temperature of step i), and forming a well layer of

$In_yGa_{1-y}N$, wherein y is greater than x, over the quantum dots;

iv) maintaining the substrate at about the temperature of step i), and forming a first cap layer of $In_zGa_{1-z}N$, wherein z ranges from 0 to 0.10, over the well layer;

v) forming a second cap layer of GaN or AlGaN over the first cap layer; thereby obtaining a device that emits light in blue or green wavelengths.

10. The method of claim 9, wherein the surface layer of the substrate is a layer of GaN or $In_xGa_{1-x}N$, wherein x ranges from 0 to 0.10, that is grown at the same temperature as the temperature used in step i).

~~**10**. The method of claim 5 or 6 **3**, wherein the forming steps are performed by metalorganic chemical vapor deposition using trimethyl indium, triethyl indium, ethyldimethyl indium or a mixture of at least two thereof as an indium precursor.~~

~~14 **11**. The method of any one of claims 5, 6 or 13 **claim 3 or 10**, wherein trimethyl gallium, triethyl gallium, ethyldimethyl gallium or a mixture of at least two thereof is used as a gallium precursor.~~

~~15 **12**. The method of claim 14 **11**, wherein ammonia or dimethylhydrazine is used as a nitrogen **Nitrogen** precursor and hydrogen, nitrogen or a mixture thereof is used as a carrier gas.~~